

No. 1 in Modern Energy



Vestas Nacelles Americas Global Purchasing and Supply Chain

Gene Cuenot, Vice President

Vestas[®]

Wind Power Supply Chain Challenges and Opportunities

- Overview of the Industry
- Vestas Nacelles Footprint
- Commodities
- Supply Chain Challenges
- Supplier Opportunities
- Q & A

Overview of the Industry



Falling prices in energy demand

A call for change

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DAVOS 2008

January 28, 2008 - Updated 08:25 GMT (17:25 WET)

Davos elite leaves, fearing dark days

By Barry Stein

DAVOS, Switzerland (CNN) — The world will weather its financial storm, but must battle climate change, poverty and conflict to reap a new "industrial revolution," the global business elite said Sunday, trying to dispel pessimism that has hung over a major meeting in Switzerland.

As the five-day World Economic Forum wrapped up in the remote ski resort of Davos, the events co-chairs gathered for one last effort to steer the agenda away from market turmoil and promote its goals of achieving positive global change.

But the meeting — which began a day after the U.S. Federal Reserve made a surprise 0.75 point rate cut as it struggled to calm roller coaster financial markets, a move that drew mixed reaction in Davos — was rocked with recession anxieties to the last.

There was also optimism that the annual meeting of more than 2,000 global powerbrokers — often criticized for being little more than a talking shop —

STORY HIGHLIGHTS

- Meeting of 2,000 leaders
- Global financial heads
- Davos Forum accused

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Home > Technology & Science > Global Warming

Antarctic Mud Yields Climate Change Insight

May Help Scientists Predict How the Continent Will Withstand Global Warming

By DOUGLAS FOX
Feb. 24, 2008

CHRISTIAN SCIENCE MONITOR

McMurdo Station, Antarctica

With summers both intense and ephemeral, life here is a race against the revolving seasons. Summer daylight never ceases at this US research base on Ross Island, just off the coast of Antarctica. The sun runs endless laps around the sky, and for those who live here, work never stops.

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CNN NEWS
One Minute World News
Last updated: Thursday, 10 January 2008, 17:41 GMT
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New nuclear plants get go-ahead

A new generation of nuclear power stations in the UK has been given formal backing by the government.

Business Secretary John Hutton told MPs they would give a "safe and affordable" way of securing the UK's future energy supplies while fighting climate change.

He said any plants would be built at or near existing reactors by private firms and said he hoped the first one would be completed "well before 2020".

Critics say new reactors will be expensive, dirty and dangerous.

The government will not be building any reactors itself — but it says it will take steps, such as streamlining the planning process and identifying likely sites, to encourage private operators to build them.

Mr Hutton conceded that no nuclear plant had been built anywhere in the world without public money — but he insisted there would be no subsidies from the UK government.

GOVERNMENT PLANS

- Speed up planning process to move 3 new reactors forward except in emergencies
- No limit to amount of electricity generated by nuclear power
- New independent body to

VIDEO AND AUDIO NEWS
Animation shows how a power plant generates energy

ENERGY IN THE UK
KEY FIGURES

- UK's electricity gets go-ahead
- Ministers had nuclear decision
- No nuclear subsidies, say Tories
- 'Nuclear' not answer' - Lib Dems

INTERACTIVE AUDIO
Power calculator
How would you like the UK's electricity to be generated by 2020?

ANALYSIS

- UK goes back to the future
- The politics of nuclear power plan
- GB's nuclear power plans
- New nuclear re-emerged
- Nuclear around the world
- New nuclear power works
- The costs of nuclear energy
- Designing the next reactor

RELATED INTERNET LINKS

- Department for Business and Enterprise
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US, China to Capture Coal Mine Methane to Battle Global Warming

By Jim Ghoran 9:37
Feb. 21 (Bloomberg) — U.S. and Chinese companies will invest \$2.8 billion to recycle coal mine methane to generate electricity through a United Nations program to slow global warming.

The joint venture, announced today by the U.S. Energy Department, will buy 22 generators that will be fueled by naturally occurring methane from the Hebi mines in China's Henan Province. Each will generate 500-kilowatts of electricity, enough to power about 400 U.S. homes. Central China Sakel Technology Inc. is the managing partner for the group, which includes CMH Energy LLC of Lake Oswego, Oregon, and Milestone Consulting LLC, in Frederick, Maryland.

The project can sell tradable emissions credits certified by the UN under the Kyoto Protocol, a climate change treaty ratified by every industrialized country except the U.S. China Sakel will create about 250,000 emissions credits through the treaty's Clean Development Mechanism, each representing one ton of carbon dioxide emissions. Methane that seeps from the mines has more than 20 times the warming potential of carbon dioxide.

These projects are reducing emissions in China while generating returns for U.S. investors, Elliot Dinger, director of international strategies at the Pew Center on Global Climate Change, said in an interview.

The U.S. government will provide technical assistance for the project through President George W. Bush's Asia-Pacific Partnership on Clean Development and Climate, said James Connaughton, the administration's chief environmental adviser. The voluntary partnership promotes the transfer of technology between governments and companies.

Profit, Safety, Waste

- The driver of the deal is its profitability, its reduction of safety hazards to miners from explosions, and the value of energy that's produced that would otherwise be wasted, Connaughton said in an interview.
- China is part of the Kyoto protocol and they're entitled to participate in the Clean Development Mechanism.

The New York Times
Tuesday, February 26, 2008
WORLD U.S. N.Y. REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION
ENVIRONMENT SPACE & COSMOS

Science

Science > TOPICS > GLOBAL WARMING
Global Warming

On Feb. 2, 2007, the United Nations scientific panel studying climate change declared that the evidence of a warming trend is "unequivocal," and that human activity has "very likely" been the driving force in that change over the last 50 years. The last report by the group, the Intergovernmental Panel on Climate Change, in 2001, had found that humanity had "likely" played a role.

The addition of that single word "very" did more than reflect mounting scientific evidence that the release of carbon dioxide and other heat-trapping gases from smokestacks, tailpipes and burning forests has played a central role in raising the average surface temperature of the earth by more than a degree Fahrenheit since 1950.

It also had one other effect: It had convinced the world's governments to take action.

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Hanging Up, Hanging Up - Ost
Amazon (Denmark)

London's climate: Change through the ages

By Jeremy Lovell

LONDON (Reuters Life!) — From floods to freezes and famines London's climate has changed throughout history and the city has always bounced back.

But the current phase of human-induced global warming is of a different order of magnitude and the outcome is far less certain, according to a new exhibition at the Museum of London.

"Climate change happens and has always happened and people have had to adapt to it," said curator Jon Cotton. "This time it is different. Never before have we had 6.5 billion people on the planet pumping carbon dioxide into the atmosphere."

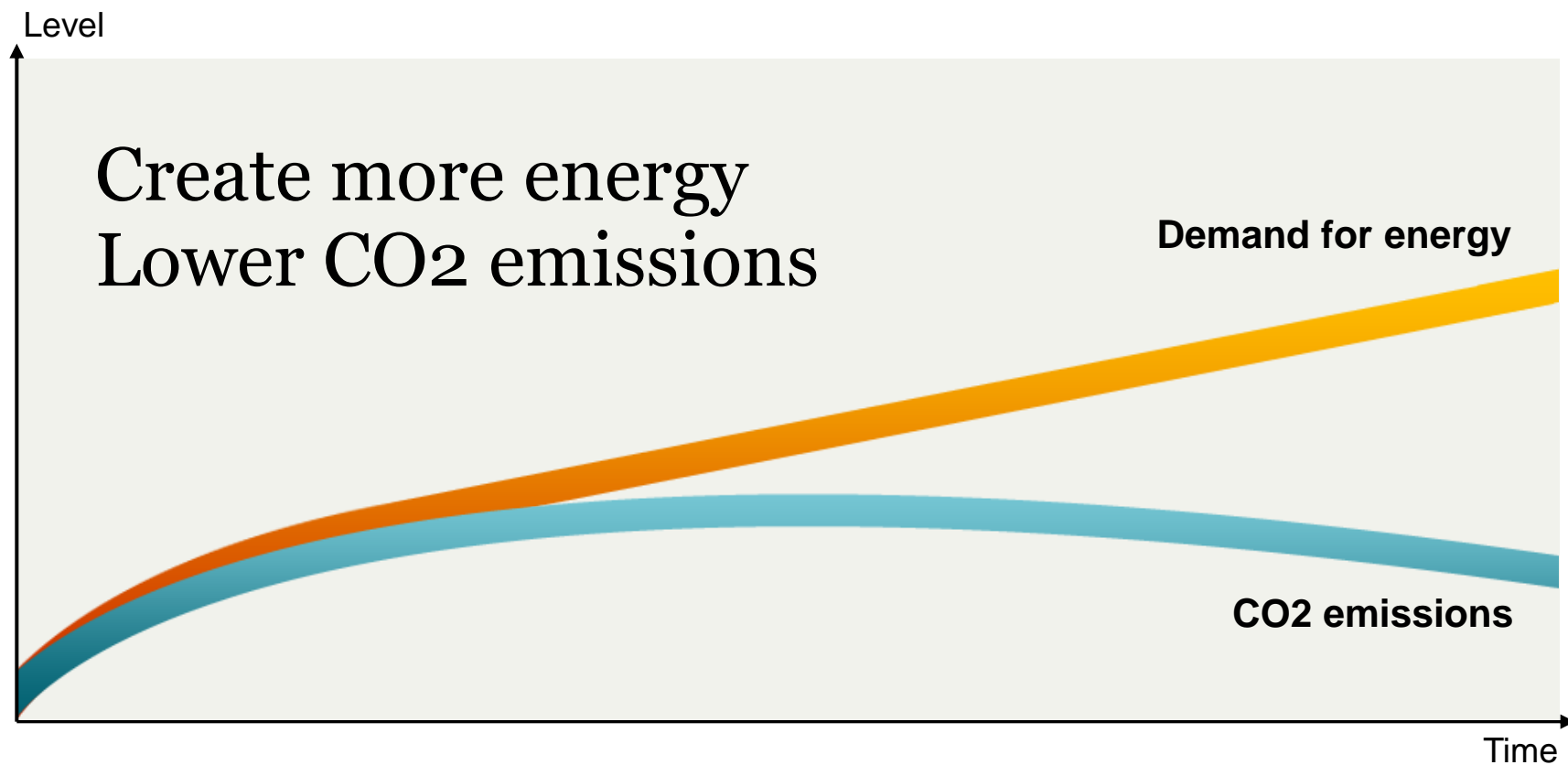
The exhibition, which takes the form of a timeline with audiovisual support, tracks the key climatic events in the history of the city.

Among others it notes the great whirlwind of 1091, the big freeze of 1170, the drought of 1342, the big freeze of 1826, the floods of 1928 and 1953 and the heatwaves of 1976 and 2003 and notes that each time the city survived.

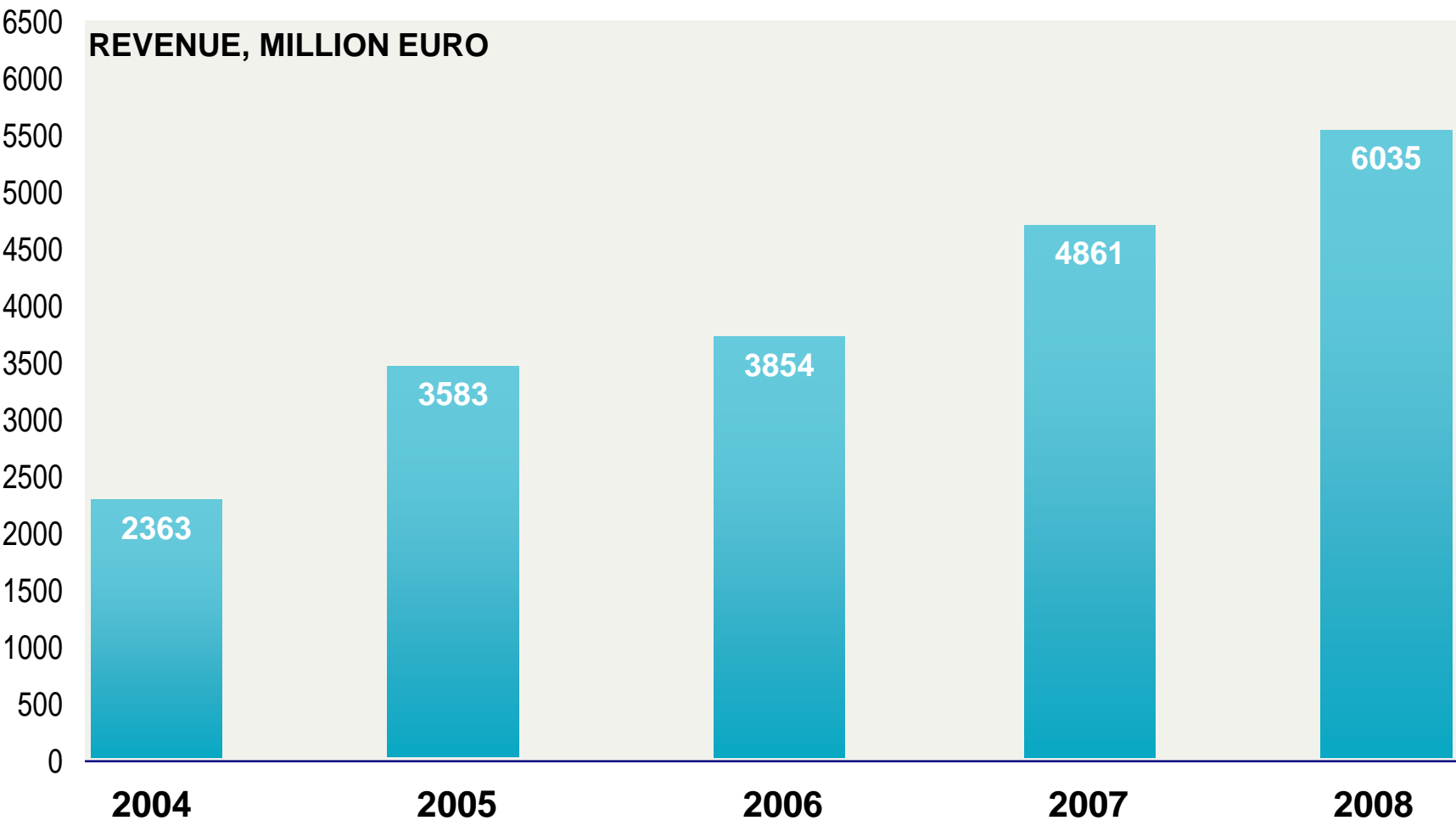
For several centuries a combination of what is termed the Little Ice Age and the constricted flow of the River Thames because of the old London Bridge, it was frequently cold enough in winter to hold fairs on the frozen river.

TECHNOLOGY
Sony Eyes Sharp LCD Panels

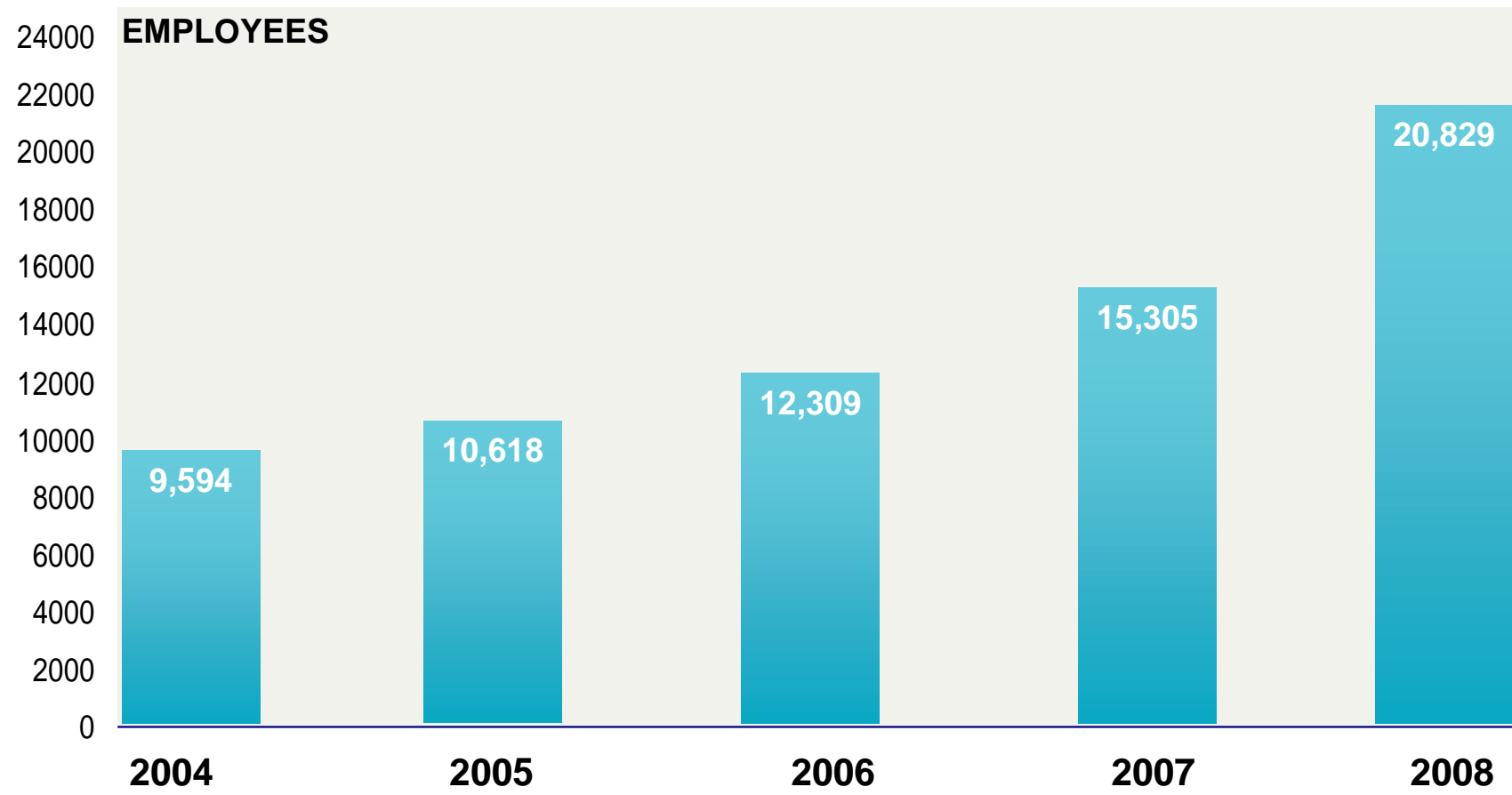
We are facing a dilemma:



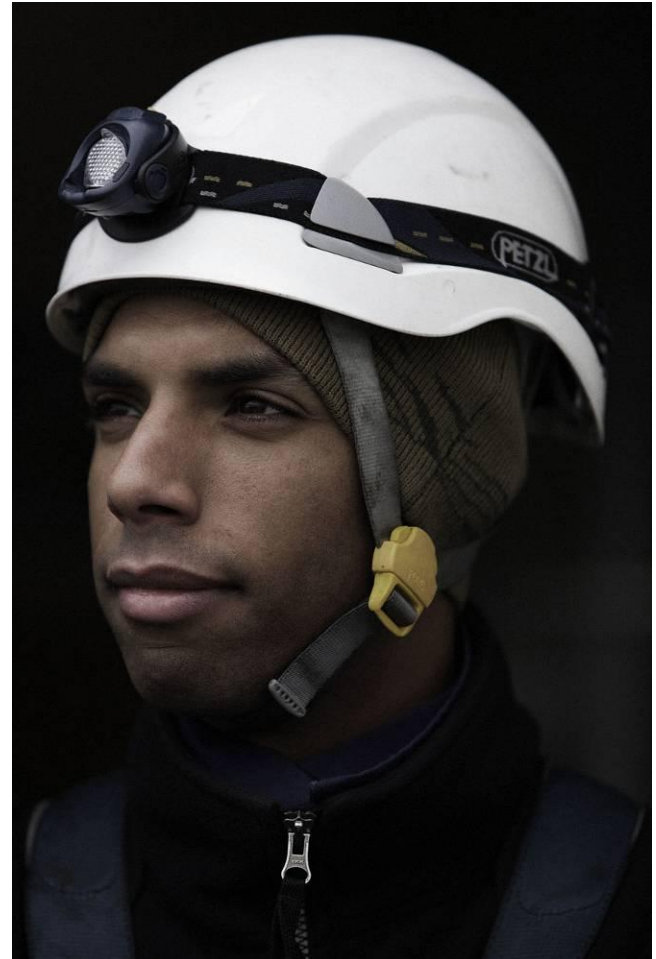
Growing revenue



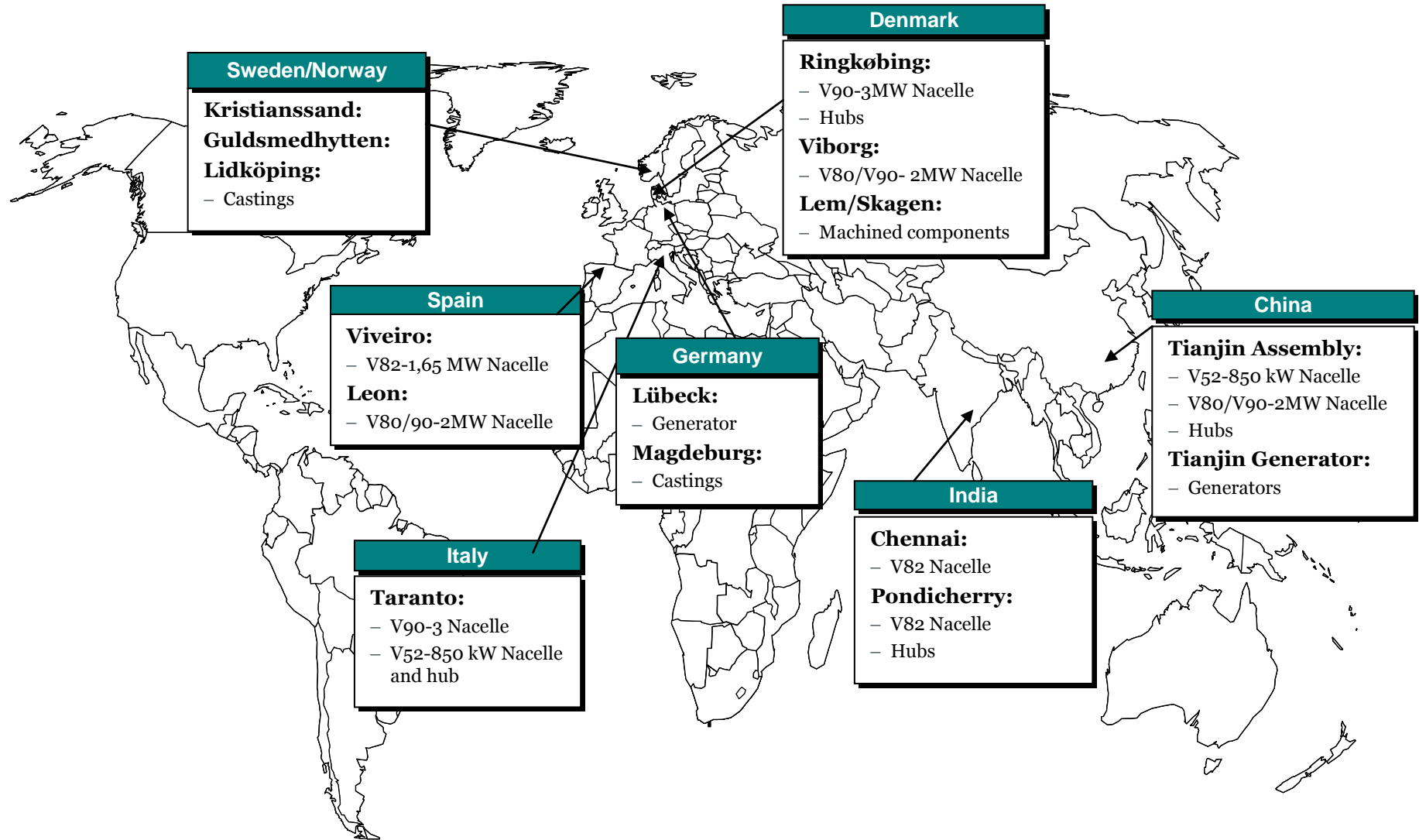
Ramping up our human resources



Footprint



Overview of Nacelles current global footprint



N. America Footprint

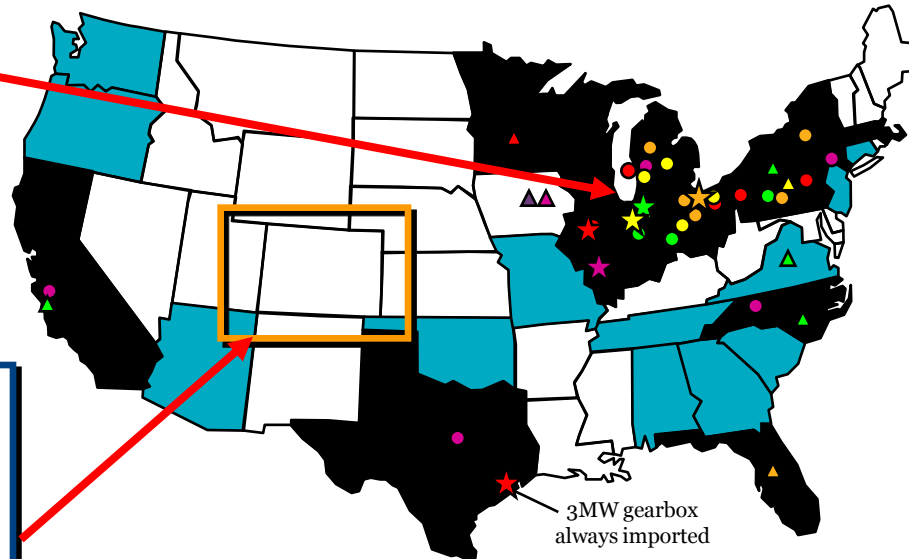
- **Americas' Sourcing drivers:**
 - In the region for the region manufacturing and sourcing
 - Shorter response time to market
 - Competitiveness, capability and capacity
 - Reduce currency exposure

Chicago Offices:
Purchasing and Supply Chain

Colorado Production:

Blades Windsor
Towers*1: Pueblo
Nacelles*1: Brighton
Blades *1: Brighton

*1 not opened yet



State Ranking for Potential Suppliers

- Top Quartile
- 2nd Quartile

Turbine Manufacturers

- ▲ GE
- ▲ Gamesa
- ▲ Suzlon
- ▲ Siemens
- ▲ Mitsubishi
- ▲ Clipper

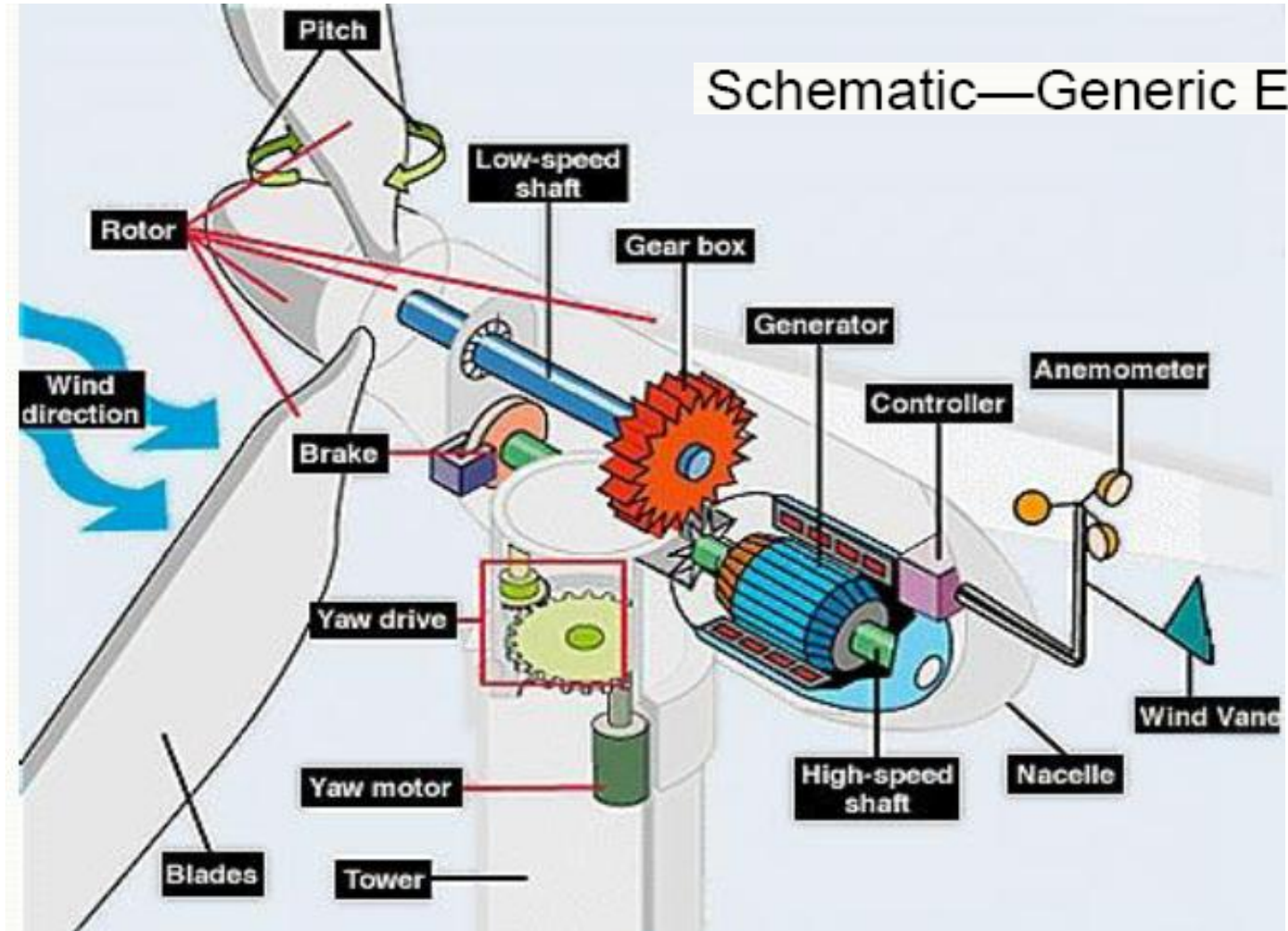
Supplier Information

- | | Existing Suppliers | Modeled Location |
|--------------|--------------------|------------------|
| Foundry | ● | ★ |
| Machining | ● | ★ |
| Gears | ● | ★ |
| Generators | ● | ★ |
| Bearings | ● | ★ |

Commodities



Product Overview

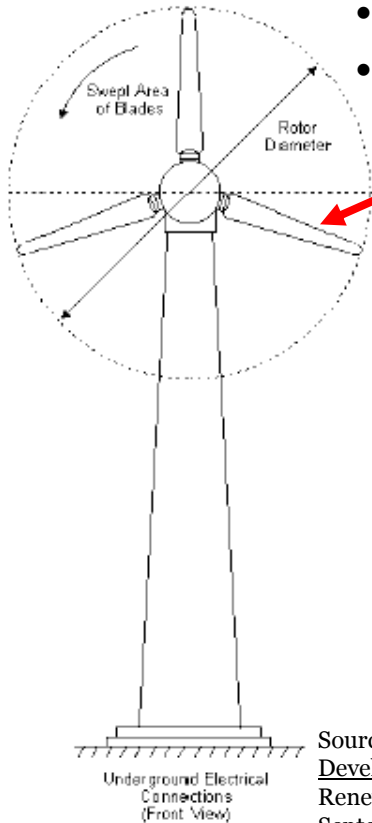


Source: www1.eere.energy.gov/windandhydro/wind_how.html

Blades - Overview

Blades:

- Generally glass-reinforced fiber
- Upwards to 50m and greater in length
- Utilizes principle of lift - converts wind energy to mechanical energy

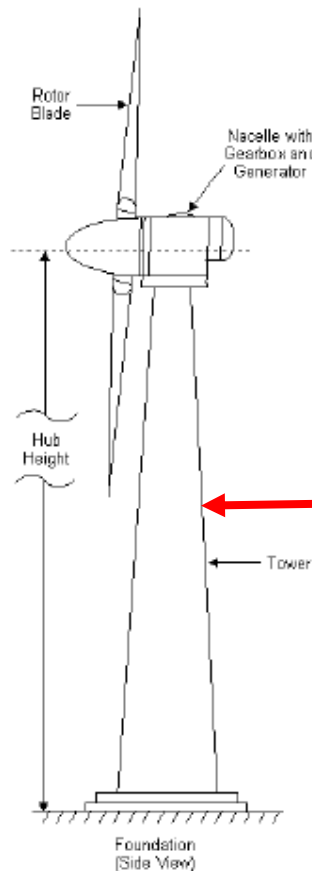


Source: Sterzinger, G. and Svrcek, M., Wind Turbine Development: Location of Manufacturing Activity, Renewable Energy Policy Project, Technical Report, September, 2004.



Source: http://www.middelgrunden.dk/MG_UK/project_info/turbine.htm

Towers - Overview



Source: Sterzinger, G. and Svrcek, M., Wind Turbine Development: Location of Manufacturing Activity, Renewable Energy Policy Project, Technical Report, September, 2004.



Source: http://www.middelgrunden.dk/MG_UK/project_info/turbine.htm

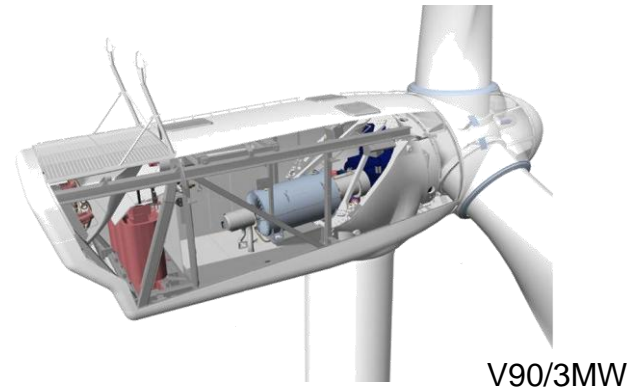
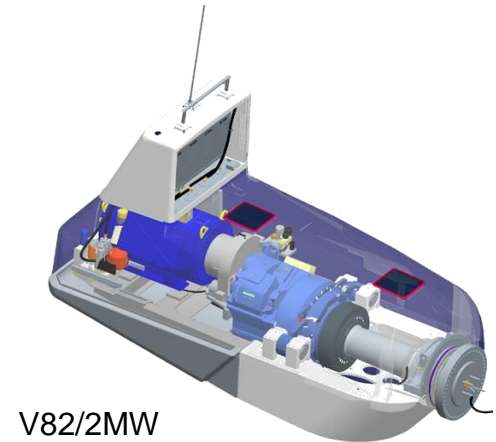
Tower:

- 60 – 100M in height assembled
- 200 – 400 tons assembled
- Rolled steel tubes
 - Connected in series
 - Built/shipped in sections due to size and weight
 - Hollow structure with ladder for maintenance access
- Flanges and bolts joining each section
- Concrete base providing stable foundation
- Concrete segmented and hybrid towers

Nacelles - Overview

Supply opportunities:

- Bearings
- Hydraulics, pumps
- Lubrications systems
- Plastics
- Wires and Cables
- Transformers
- Castings
- Weldings
- Fasteners
- Machined components
- Sheet metal work
- Lifts



Supply Chain Challenges



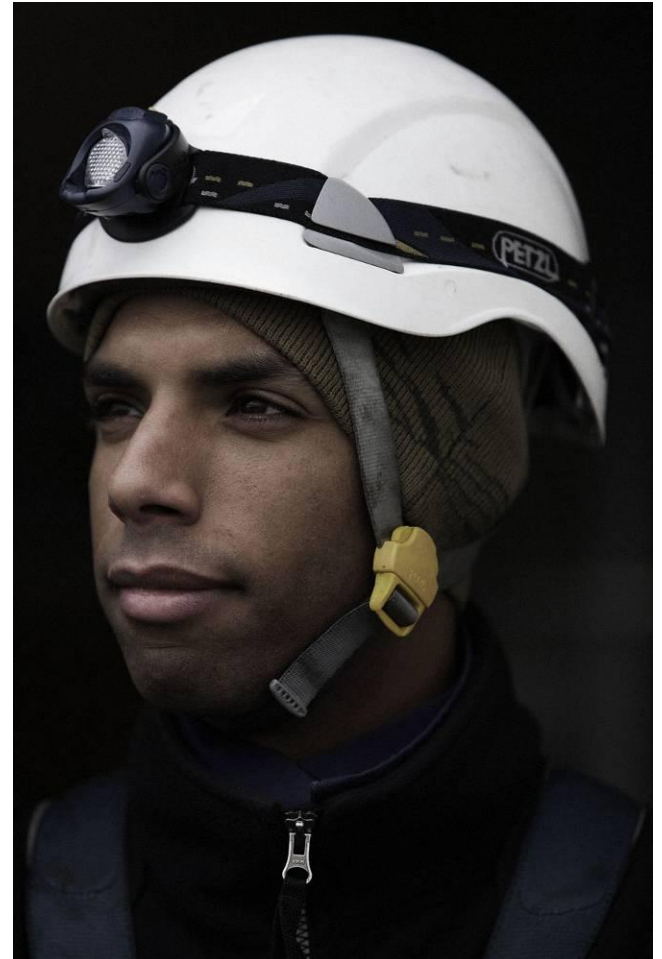
Supply Chain Challenges

- Extreme growth - (~25%+/year)
- Economic Downturn - Suppliers are readily visible to OEMs
- Critical components – Some capacity bottlenecks
- Commodities: Volatility to stabilization
- Credit Conditions – May prevent capacity investment

Supply Chain Challenges

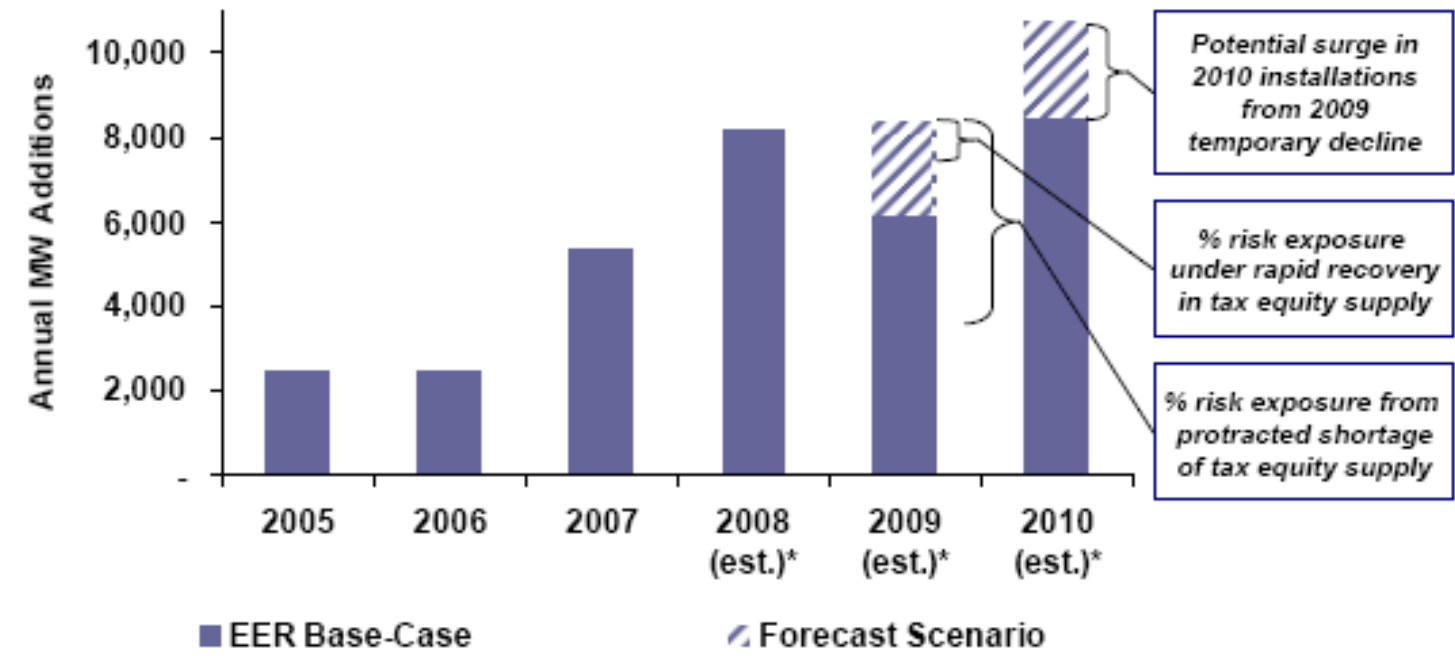
- Demand for High Quality and Delivery – Vestas working towards 6 Sigma
- Competition – Major OEM's competing against LCC's, mainly China. Suppliers must be competitive
- NA Sourcing - European standards can be difficult to convert
- Conferences and workshops - Enable connection to OEMs
- ISO9000 baseline and solid work practices

Supplier Opportunities



Opportunities for Suppliers

Exhibit 3: EER US Wind Growth Forecast Scenarios, 2005–2010



Note: *EER's annual US wind growth forecasts are based on market factors prior to financial crisis. Figures are subject to revision pending further market developments.

Source: Emerging Energy Research

Opportunities for Suppliers

- Extreme growth – Opportunity for quality supplier expansion
- Focus on renewable energy – Drive growth
- Vestas offers support to key suppliers - Optimize processes, etc.
- Vestas Nacelles - Sources a wide range of components, such as gears and gear boxes - highly specialized for wind applications

Opportunities for Suppliers

Wind Industry – Moving towards:

- Innovations – V112 Turbine
- Increased co-operation between OEMs and manufacturers
- Increased life of product, and not as in the past, where new models often were introduced every 2 years
- Dual and multiple sourcing of critical components
- Maturity leading to partnerships, long term agreements etc.

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Thank you for your attention

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